

低功率射頻電機試驗報告

申請廠商 台灣愛普生科技股份有限公司
110臺北市信義區松仁路100號15樓
製造廠商 Seiko Epson Corporation
產品名稱 Intelligent Controller
廠牌 EPSON
型號 BO-IC400
法規 LP0002: 5.20.2節

實驗室資訊

台灣檢驗科技股份有限公司 射頻實驗中心

新北市新北產業園區五工路134號

認證有效期間：109年01月30日起至110年06月13日止

試驗件收樣日期 民國109年05月29日

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黃威豪



報告簽署人
黃威豪簽章

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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2020/50081	Rev.00	Original.	Jul. 28, 2020	Revised By: Tiffany Kao

Note:

- 1、天線資訊由報告申請人提供，此報告之測試結果僅適用實際收取的樣品。

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測試標準

國家通訊傳播委員會低功率射頻電機技術規範

民國 107 年 1 月 10 日版本

待測裝置已於台灣檢驗科技股份有限公司射頻實驗中心，依據國家通訊傳播委員會於中華民國一百零七年一月頒佈之低功率射頻電機技術規範測試。

台灣檢驗科技股份有限公司根據此條文規範項目測試，測試各項數據皆能符合此規範規定之限度值。

台灣檢驗科技股份有限公司依低功率射頻電機技術規範審驗要點規範製作測試結果報告，測試結果評判為 合格。

備註：

1. 報告中所描述之測試結果和待測設備的架構組合，均根據實際量測情況作詳實的記錄，且本測試報告僅對上述待測設備樣品負責。
2. 此份報告未經本公司同意，不得部份摘錄複製使用。

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測試實驗室資料:

實驗室認可登錄 : 中華民國實驗室認證體系

認可編號 : TAF 3702, 認可頻率範圍9kHz ~ 200GHz

認證有效期間 : 109年01月30日起至110年06月13日止

測試場地 : 桃園市龜山區(華亞科技園區)科技一路2號

實驗室名稱 : 台灣檢驗科技股份有限公司
射頻實驗中心

實驗室地址 : 新北市新北產業園區五工路134號

電話 : 886-2-22993939

傳真 : 886-2-22982698

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實驗室之量測不確定度

量測項目	量測不確定度 (擴充不確定度)		
傳導干擾量測	電源線	0.15-30MHz	2.586dB
輻射干擾量測 (3m測距)	水平極化	9kHz - 30MHz	2.3dB
		30-167MHz	4.22dB
		167-500MHz	3.44dB
		0.5-1GHz	3.39dB
		1-18GHz	4.08dB
		18-40GHz	4.08dB
	垂直極化	9kHz - 30MHz	2.3dB
		30-180MHz	3.37dB
		180-417MHz	3.19dB
		0.417-1GHz	3.19dB
		1-18GHz	4.04dB
		18-40GHz	4.04dB
頻率誤差量測	範例一	2.4 GHz	290 Hz
	範例二	5 GHz	724.3 Hz
輸出功率	傳導方式	2.4 GHz	1.3 dB
		5 GHz	1.55 dB
有效輻射功率 (輻射方式)	水平極化	2.4GHz	4.21 dB
		5 GHz	4.62 dB
	垂直極化	2.4 GHz	4.42 dB
		5 GHz	4.74 dB
功率頻譜密度	傳導方式	2.4GHz	1.3dB
		5GHz	1.67dB
鄰頻道功率量測 (輻射方式)	水平極化	30-167MHz	4.22dB
		167-500MHz	3.44dB
		0.5-1GHz	3.39dB
	垂直極化	30-180MHz	3.37dB
		180-417MHz	3.19dB
		0.417-1GHz	3.19dB

附註: 1. K=2 即代表測試結果具有95%的量測可信度。

2. 本報告中的符合性判定僅依據試驗結果，不考慮其試驗結果的量測不確定度。

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目錄

1	一般資料	7
2	適用規範	11
3	最大暴露允許值 (MAXIMUM PERMISSIBLE EXPOSURE, MPE)	12
	產品照片	15

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1 一般資料

1.1 產品描述

產品名稱	Intelligent Controller	
型號	BO-IC400	
產品商標	EPSON	
Product HW version	DVT	
Product SW version	Android 9	
USB Cable	Model No.: D0017100R2AHR, Supplier: HOTRON	
使用電源	3.85Vdc from Rechargeable Li-ion polymer Battery or 5V from AC/DC Adapter	
	Battery:	Model No.: EAR1B Supplier: ShenZhen KAYO Battery Co., Ltd.

1.2 最大輸出功率

最大輸出功率參考報告如下:

WLAN 2.4GHz	Report Number:	ER/2020/50105
	Test Lab:	台灣檢驗科技股份有限公司 射頻實驗中心
WLAN 5GHz	Report Number:	ER/2020/50106
	Test Lab:	台灣檢驗科技股份有限公司 射頻實驗中心

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WLAN 2.4GHz:

Wi-Fi	發射頻帶	頻道數	輸出功率	Modulation Technology
11b/g	2412-2462	11	b: 22.41 dBm g: 24.20 dBm	DSSS, OFDM
11n	HT20 2412-2462	11	23.70 dBm	OFDM
11n	HT40 2422-2452	7	24.62 dBm	OFDM
調變方式:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM		
Transition Rate:		802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps		

天線型式/天線增益

天線型式	Supplier	Part No.	發射頻帶(MHz)	天線增益(dBi)
PIFA	Kuang Ho Technology CO., LTD	K1606-00028F1BS1	2412-2462	0.2 (Chin 0)
PIFA	Kuang Ho Technology CO., LTD	K1606-00029E1BS1		2.7 (Chin 1)

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調變	發射頻帶 (MHz)		輸出功率 (dBm)	頻道數 (Channels)
802.11 a mode	5180 ~5240		15.84	4
	5260 ~5320		15.73	4
	5500 ~5720		15.90	12
	5745 ~5825		15.88	5
802.11n HT20 / ac VHT20 mode	HT20:	5180 ~5240	15.41	4
	HT20:	5260 ~5320	15.37	4
	HT20:	5500 ~5720	15.39	12
	HT20:	5745 ~5825	15.42	5
802.11n HT40 / ac VHT40 mode	HT40:	5190 ~5230	15.47	2
	HT40:	5270 ~5310	15.47	2
	HT40:	5500 ~5710	15.33	6
	HT40:	5745 ~5825	15.23	2
802.11 ac VHT80 mode	VHT80:	5210	15.23	1
	VHT80:	5290	15.35	1
	VHT80:	5530 ~5690	15.79	3
	VHT80:	5775	15.60	1
調變方式	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only			
Transition Rate:	802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 - 300.0Mbps 802.11 ac_20MHz: 6.5 –173.3Mbps 802.11 ac_40MHz: 13.5 –400.0Mbps 802.11 ac_80MHz: 29.3 – 866.7Mbps			

天線型式/天線增益

天線型式	Supplier	Part No.	發射頻帶(MHz)	天線增益(dBi)
PIFA	Kuang Ho Technology CO., LTD.	K1606-00028F1BS1	5150~5250 5250~5350 5470~5725 5725~5825	1.7 (Ch0) 2.0 (Ch0) 1.9 (Ch0) 0.8 (Ch0)
PIFA	Kuang Ho Technology CO., LTD.	K1606-00029E1BS1	5150~5250 5250~5350 5470~5725 5725~5825	3.3 (Ch1) 3.3 (Ch1) 3.5 (Ch1) 1.8 (Ch1)

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1.3 測試方法之依據

本測試報告之所有項目皆依據國家通訊傳播委員會低功率射頻電機技術規範(LP0002, 107.1.10版本)如無國家標準可適用者，得依美國EIA、IEEE ANSI檢驗法檢驗，及美國FCC 47 CFR Part 2有關檢驗之規定及參考ANSI 63.10:2013、FCC CFR 47 15.249之檢驗法。

項次	測試項目	適用規範	測試結果	量測設備	備註
1	最大暴露量允許值	低功率射頻電機技術規範 5.20.2節	請參閱5.3節	請參閱4.1節	合格
	以下空白				

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2 適用規範

2.1 規範要求

依據 NCC 低功率射頻電機技術規範之 5.20.2，其發射機距離人體 20 公分以上者，需證明其符合電波暴露量之要求，限制值如下：

(1) 職業性/可控制之暴露

頻率範圍 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (minutes)
0.3-3.0	614	1.63	*100	6
3-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500	-----	-----	f/300	6
1,500- 100,000	-----	-----	5.0	6

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位：百萬赫(MHz)。

(2) 一般人/不可控制之暴露

頻率範圍 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (minutes)
0.3-3.0	614	1.63	*100	30
3-30	1842/f	4.89/f	*180/f ²	30
30-300	27.5	0.073	1.0	30
300-1,500	-----	-----	f/1500	30
1,500- 100,000	-----	-----	1.0	30

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位：百萬赫(MHz)。

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3 最大暴露允許值 (MAXIMUM PERMISSIBLE EXPOSURE, MPE)

3.1 規範要求

依據 NCC 低功率射頻電機技術規範之 5.20.2，其發射機距離人體 20 公分以上者，需證明其符合電波暴露量之要求，限制值如下：

(3) 職業性/可控制之暴露

頻率範圍 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (minutes)
0.3-3.0	614	1.63	*100	6
3-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500	-----	-----	f/300	6
1,500-100,000	-----	-----	5.0	6

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位：百萬赫(MHz)。

(4) 一般人/不可控制之暴露

頻率範圍 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (minutes)
0.3-3.0	614	1.63	*100	30
3-30	1842/f	4.89/f	*180/f ²	30
30-300	27.5	0.073	1.0	30
300-1,500	-----	-----	f/1500	30
1,500-100,000	-----	-----	1.0	30

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位：百萬赫(MHz)。

3.2 適用種類

此待測物，為一般市面上販售，固適用表 2) 之限制值

3.3 最大暴露允許值之評估

僅以最差模式進行評估，評估結果請見下頁。

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最差模式_WLAN 2.4G

802.11b_2Tx								
CH	Freq. (MHz)	Data Rate	Peak Output		Total Peak Output Power (dBm)	Limit		RESULT
			CH 0	CH 1				
1	2412	1	19.72	18.54	22.18	1 Watt =	30.00 dBm	PASS
6	2437	1	20.11	18.56	22.41	1 Watt =	30.00 dBm	PASS
10	2457	1	19.3	19.18	22.25	1 Watt =	30.00 dBm	PASS
802.11b_2Tx								
CH	Freq. (MHz)	Data Rate	Avg. Output		Total Avg Output Power (dBm)	Limit		RESULT
			CH 0	CH 1				
1	2412	1	16.73	16.68	19.76	1 Watt =	30.00 dBm	PASS
6	2437	1	16.89	16.75	19.88	1 Watt =	30.00 dBm	PASS
11	2462	1	16.82	16.73	19.83	1 Watt =	30.00 dBm	PASS

導入之公式: page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

S = 功率密度 P = 傳導功率 G = 天線增益值 R = 人體與天線之距離

Max. output power including tune-up tolerance:	19.88	(dBm)
Max. output power including tune-up tolerance:	97.27472238	(mW)
Peak Antenna gain (Maximum):	2.7	(dBi)
Peak Antenna gain (linear):	1.862087137	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm ²)
Power density at predication frequency at 20 (cm) distance	0.036	(mW/cm ²)
運算之結果: 當功率密度在 20 cm · 其最大暴露值為 0.036 (mW/cm ²) 註:工作頻率為頻率範圍1,500-100,000 (MHz), 固其對應之限制值為1.0 (mW/cm ²)		

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最差模式_WLAN 5G

802.11a_2Tx

CH	Freq. (MHz)	Data Rate	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)	RESULT
			CH0	CH1			
36	5180	6	12.9	12.51	15.84	23.98	PASS
44	5220	6	12.72	12.52	15.75	23.98	PASS
48	5240	6	12.67	12.41	15.68	23.98	PASS
52	5260	6	12.58	12.34	15.60	23.98 or $11+10\log(B) = 24.40$	PASS
60	5300	6	12.65	12.55	15.73	23.98 or $11+10\log(B) = 24.34$	PASS
64	5320	6	12.45	12.37	15.54	23.98 or $11+10\log(B) = 24.51$	PASS
100	5500	6	12.7	12.77	15.87	23.98 or $11+10\log(B) = 24.43$	PASS
116	5580	6	12.48	12.4	15.57	23.98 or $11+10\log(B) = 24.37$	PASS
140	5700	6	12.84	12.7	15.90	23.98 or $11+10\log(B) = 24.25$	PASS
144	5720(U-NII 2C)	6	11.30	11.10	14.30	23.98 or $11+10\log(B) = 24.42$	PASS
144	5720 (U-NII 3)	6	11.35	6.84	10.26	30	PASS
149	5745	6	12.83	12.4	15.75	30	PASS
157	5785	6	12.81	12.68	15.88	30	PASS
165	5825	6	12.71	12.69	15.83	30	PASS

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$$S = PG/4\pi R^2$$

S = 功率密度 P = 傳導功率 G = 天線增益值 R = 人體與天線之距離

Max. output power including tune-up tolerancel:	15.90	(dBm)
Max. output power including tune-up tolerancel:	38.9045145	(mW)
Peak Antenna gain (Maximum):	3.5	(dBi)
Peak Antenna gain (linear):	2.238721139	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5700	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm ²)
Power density at predication frequency at 20 (cm) distance	0.017	(mW/cm ²)
運算之結果: 當功率密度在 20 cm · 其最大暴露值為 0.017 (mW/cm ²) 註:工作頻率為頻率範圍1,500-100,000 (MHz), 固其對應之限制值為1.0 (mW/cm ²)		

~ End of Report ~

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